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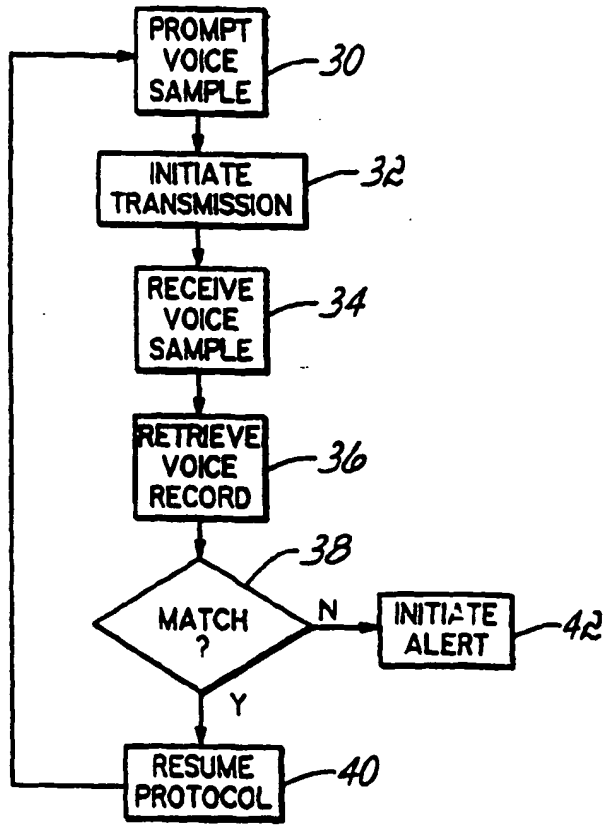
(54) Title: PILOT AUTHENTICATION SYSTEM

(57) Abstract: Method and apparatus authenticates a pilot voice sample against a stored voice record.



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Pilot Authentication System

Field of the Invention

The present invention relates generally to flight technologies, and more particularly, to flight security and authentication applications.

Background of the Invention

Security concerns have become ubiquitous within the commercial airline industry. For instance, government and commercial agencies implement measures to ensure vital flight systems remain exclusively in the hands of authorized personnel. Such steps include requiring key personnel, such as pilots, to wear identifying uniforms and badges. Such badges and other identification may be routinely verified at checkpoints prior to flight. In some instances, flight crews themselves, provide some measure of security in that they may possess some personal familiarity with pilots assigned to the crew.

Preflight check procedures may provide some additional measure of security. Namely, the sequence of preflight highly standardized safety checks may dually serve as a form of assurance that a pilot has been indoctrinated in airline protocol. Airborne provisions may include the availability of a very high frequency (VHF) emergency "squawk" signal. Such an emergency transmission may be initiated by a pilot turning a switch located in the cockpit in response to a hijacking or other emergency situation. As

such, the emergency squawk transmission may apprize other air traffic and control facilities of an emergency condition.

Despite such provision, however, airline security procedures remain fraught with the potential for compromise. Namely, airline identification badges may easily be counterfeited by an imposter. Similarly, uniforms may be stolen or fabricated to gain access to vital flight systems. Checkpoints may be circumvented by savvy saboteurs familiar with flight security procedures. Similarly, unauthorized personnel may capitalize on the inevitable unfamiliarity systemic among flight crews, which are routinely assembled from personnel who have never before met. In flight radio checks from a pilot to air traffic control stations may reveal little as to the identity of the pilot, as flight vernacular and procedures may be duplicated relatively easily. Moreover, a highjacker may disable a transponder prior to a pilot activating an emergency squawk transmission, frustrating attempts to alert authorities.

Consequently, what is needed is an improved method for verifying the identity of a pilot.

Summary of the Invention

The present invention provides an improved method, apparatus and program product for verifying an identity of a pilot in a manner that

addresses above-identified shortcomings of known authentication procedures. To this end, and in accordance with the principles of the present invention, a voice record correlated with an authorized pilot is stored within a database. In a preferred embodiment, the data base and associated voice record is stored at an air traffic control facility in communication with the pilot. As such, air traffic control may receive a voice sample from the pilot in a radio transmission.

The voice sample may be evaluated against a stored voice record to determine if a biometric match exists. Should the match be unsuccessful, then a warning signal may be generated and transmitted to the air traffic control. In another embodiment, the voice record of the pilot is stored locally at the air craft. As such, a discrepancy between a submitted voice sample and the locally stored voice record causes the aircraft to generate and transmit the warning signal to air traffic control. Preferably, both the voice record and sample are encrypted in either embodiment.

The above and other objects and advantages of the present invention shall be made apparent from the accompanying drawings and the description thereof.

Brief Description of the Drawing

The accompanying drawing, which is incorporated in and constitutes a part of this specification, illustrate an embodiment of the invention and, together with a general description of the invention given above, and the detailed description of the embodiments given below, serves to explain the principles of the present invention.

The figure is a flow chart outlining method steps suited to verify the identity of a pilot in a manner consistent with the principles of the present invention.

Detailed Description of Specific Embodiments

With reference generally to the drawing, there is shown a flow chart suited to authenticate the identity of a pilot in communication with an air traffic control facility. More particularly, block 30 of the figure may prompt the pilot to speak into a radio transceiver. For instance, an air traffic control transmission or on-board software may prompt the pilot to initiate a voice transmission at regular or random intervals. Alternatively, the pilot may initiate speech as part of an indoctrination procedure or in accordance with other flight procedures. For example, the pilot may initiate a radio transmission at scheduled flight check points or at preset times. At block 32,

the voice sample is conveyed within a radio transmission to air traffic control, where it is received at block 34.

In response to receiving the transmission and associated voice record, software incident on a computer at air traffic control retrieves a voice record correlated to the pilot scheduled to fly the aircraft at block 36. The voice sample, itself, may involve the pilot reciting a familiar phrase, such as a name or flight sequence. Of note, the recited phrase may be unknown to the pilot prior to being prompted at block 30. Such a scenario may provide an additional layer of security against a tape recorded voice record carried on board by an imposter.

At block 38, the software determines if a biometric voice match exists. As is known, voice recognition processes programmatically reducing a voice signature into a numerical value unique to the speaker. Compared to conventional code words and other safeguards, this numerical value is highly unique and difficult to falsify. Of note, applicable biometric authentication software may attempt several times at block 38 to authenticate a voice record prior to alerting air traffic control of a discrepancy at block 42. As is known, the authentication software compares at block 38 the numerical value against a comparable value generated from the stored voice record. By convention, the authentication software may accommodate some preset deviation from the numerical value.

Should the samples fall within a window of tolerance allowed by the program, then the flight may continue at block 40 uninterrupted. Though not shown in the figure, block 40 may additionally incorporate a step that locally saves an authenticated voice sample as a new voice record from such frequent storage of the voice record would ensure that the most recent characteristics and subtle changes of the pilot's voice that can occur over time are accounted for in the stored voice record. Alternatively, a verification signal may be generated at air traffic control. The sequence may then repeat at block 30 according to flight and/or security protocol.

While the present invention has been illustrated by a description of various embodiments and while these embodiments have been described in considerable detail, it is not the intention of the applicants to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. For example, one embodiment may call for the pilot to provide the voice record during flight indoctrination. As such, an onboard computer may both locally store the voice record and executive authentication software.

That is, a program incident on the onboard computer will prompt and compare the voice sample. Such an embodiment may have particular application where a flight path may involve a duration where the aircraft is out of radio contact. For instance, oceanic flights must routinely

travel out of the range radius of conventional directional antennas. Another benefit regards the fact that the central database of the air traffic control facility would be less burdened, as the biometric authentications could be conducted locally at an on-board computer. Furthermore, analysis may be made of speech recorded within the cockpit without prompting to determine whether voice characteristics of speech within the cockpit match previous samples of the authorized personnel.

One skilled in the art should thus appreciate that any of the embodiments and associated programs discussed above are compatible with all known biometric testing responses and may be further optimized to realize even greater efficiencies. The invention in its broader aspects is therefore not limited to the specific details, representative apparatus and method, and illustrative example shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of applicant's general inventive concept.

Having described the invention,

What is claimed is:

Claims

1. A method of verifying an identity of a pilot in communication with an air traffic control having access to a database, comprising:

storing a voice record correlated with a pilot at the database;

receiving a voice sample from the pilot at the air traffic control;

evaluating the voice sample against the voice record to determine whether there is a biometric discrepancy, and if so, signaling the air traffic control.

2. The method according to claim 1, further comprising prompting the pilot to provide the voice sample.

3. The method according to claim 1, further comprising receiving the voice sample from the pilot.

4. The method according to claim 1, further comprising retrieving the voice record from the data base in response to receiving the voice sample.

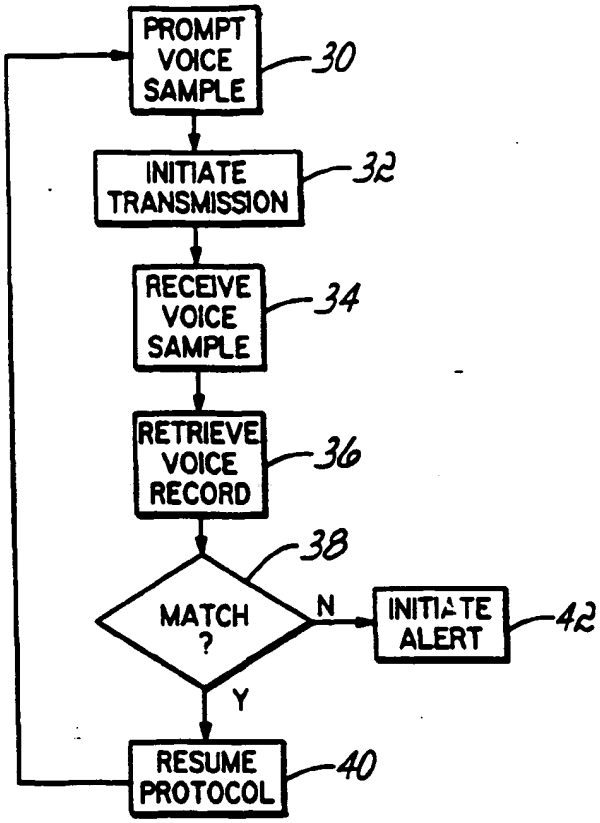
5. The method according to claim 1, further comprising encrypting the voice record.

6. An apparatus, comprising:

a memory;

a database resonant within the memory, the database storing a voice record correlated with a pilot; and

a program configured to store the voice record at the database and receive a voice sample from the pilot at an air traffic control; the program further configured to evaluate the voice sample against the voice record to determine whether there is a biometric discrepancy, and if so, signal the air traffic control.


PROMPT VOICE SAMPLE
30
INITIATE TRANSMISSION
32
RECEIVE VOICE SAMPLE
34
RETRIEVE VOICE RECORD
36
38
MATCH ?
N
INITIATE ALERT
42
Y
RESUME PROTOCOL
40

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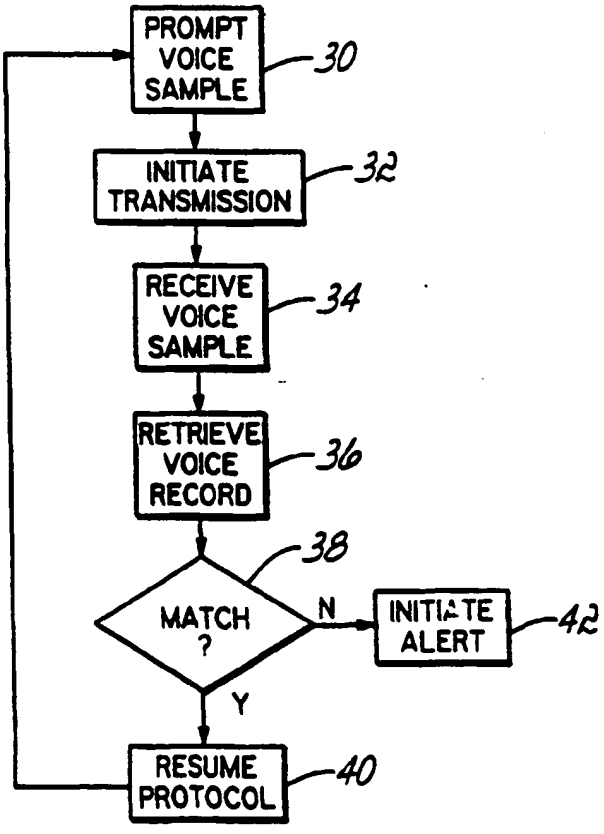
[Continued on next page]

(54) Title: PILOT AUTHENTICATION USING VOICE BIOMETRIC



(57) Abstract: Voice authentication system that uses a voice biometric. The pilot is promoted for a voice sample (30), which is transmitted to the air traffic control (32). When the air traffic controls receives the voice sample (34), the voice record is retrieved (36) for comparison of the sample and the record (38). If there is a discrepancy an alert is sent (42).

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 713/200, 201, 202

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,167,517 (GILCHRIST et al) December 26 2000 (26.12.2000), whole document.	1-4, 6
Y		5
A	US 6,185,316 B1(BUFFAM) 6 February 2001(6.02.2001), column 18, lines 0-21.	1-6
Y	US 4,993,068 (PIOSENKA et al.) 12 February 1991 (12.02.1991)	5

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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INTERNATIONAL SEARCH REPORT

PCT/US02/29695

Continuation of B. FIELDS SEARCHED Item 3:
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Search Terms: voice, biometric, authentication, verification, identification

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